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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,775	07/31/2003	Kazuya Kamon	030682-118	7888

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EXAMINER	
PIERRE LOUIS, ANDRE	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 09/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/630,775	KAMON, KAZUYA	
	Examiner	Art Unit	
	Andre Pierre-Louis	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/05/2006*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. The Amendment filed on 07/11/2006 has been received and fully considered.

2. Claim 2 is cancelled and now claims 1,3-9 are presented for examination.

Response to Arguments

3. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." State Street, 149 F.3d at 1373, 47USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)). Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention, i.e., why the applicant believes the claimed invention is useful. However, the mere fact that the claim may satisfy the utility requirement of 35 U.S.C. 101 does not mean that a useful result is achieved under the practical application requirement. The claimed invention as a whole must produce a "useful, concrete and tangible" result to have a practical application.

4.1 Claims 1,3-9 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. While the claims show a plurality of mathematical steps/calculations, the claims do not produce a "useful, concrete and tangible" result. **See MPEP 2106 [R2].**

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5.1 Claims 1,3-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. While the Applicant claims a simulator for chemical mechanical polish process, the term "simulator" is not defined in any way by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Furthermore, the claims recite "said simulator receiving:" various forms of data and recite various calculation parts; however, there is no indication in the claims whether or not these parts are part of the simulator.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.0 Claims 1, 3-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. Patent No.6, 484,300), in view of Dickenscheid et al. (U.S. patent No. 6,965,809), and further in view of Adler et al. (USPG_PUB No. 2002/0161534).

6.1 In considering the independent claim 1, Kim et al. substantially teaches a simulator for a chemical mechanical polishing process for planarizing a semiconductor substrate, particularly the steps of receiving: a pattern density data containing information about a pattern density per unit region of a fabrication pattern in a pattern forming process of a semiconductor device *(fig.1-3C, col.1 line 9-col.4 line 29; also col.7 line 24-col.12 line 18);* first and second measured data about height distributions of irregularities on said semiconductor substrate that are measured before and after a chemical mechanical polishing process executed with respect to said pattern forming process, wherein said first measured data is compared with a first calculated data about a two-dimensional distribution of irregularities on said semiconductor substrate before said chemical mechanical polishing process which is calculated from said pattern density data, a least squares analysis is performed to obtain a first correlation coefficient, and a parameter fitting is performed such that square of said first correlation coefficient becomes a maximum, and said second measured data is compared with a second calculation data about a two-dimensional distribution of irregularities on said semiconductor substrate after said chemical mechanical polishing process which is calculated from said pattern density data, a least squares analysis is performed to obtain a second correlation coefficient, and a parameter fitting is performed such that square of said second correlation coefficient becomes a maximum *(fig.3, also col.1 line*

9-col.4 line 29 and col.7 line 24-col.12 line 18); a pattern density two-dimensional distribution calculating part that receives said pattern density data, expands said pattern density data in two dimensions based on a coordinate data, and outputs it as a pattern density two-dimensional distribution image (*see Kim et al. fig.3, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30)*; a first height distribution calculating part that obtains said first calculated data by executing an operation of multiplying a pattern density at individual parts of said pattern density two-dimensional distribution image by a thickness of a laminated film laminated on said pattern density two-dimensional distribution image (*see Kim et al. fig.1-5, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30)*; and a height distribution calculating part that obtains said second calculated data by executing an operation of multiplying a pattern density at individual parts of said two-dimensional reverse Fourier image by said thickness of said laminated film laminated on said two-dimensional reverse Fourier image (*see Dickenscheid et al. fig.1-5, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30; and also Kim et al. fig.1-5, col.7 line 24-col.12 line 18)*. However, they do not expressly teach a Fourier calculating part that performs a Fourier transform of said pattern density two-dimensional distribution image and outputs a two-dimensional Fourier image; a spatial filter part that subjects said two-dimensional Fourier image to a spatial filter such that only a component having a predetermined spatial frequency passes through; and a reverse Fourier calculating part that subjects said two-dimensional Fourier image after

being subjected to said spatial filter to a reverse Fourier transform and outputs a two-dimensional reverse Fourier image. Adler et al. substantially teaches a Fourier calculating part that performs a Fourier transform of said pattern density two-dimensional distribution image and outputs a two-dimensional Fourier image (*fig.12, 13(1301))*; a spatial filter part that subjects said two-dimensional Fourier image to a spatial filter such that only a component having a predetermined spatial frequency passes through *(fig.12, 13(1302)*; and a reverse Fourier calculating part that subjects said two-dimensional Fourier image after being subjected to said spatial filter to a reverse Fourier transform and outputs a two-dimensional reverse Fourier image (*fig.12-13(1303)). Although* Kim et al. shows a three-dimension simulation, and further teaches an analyze pattern density distribution module in fig.3C (350), he does not clear teach a two-dimensional distribution. *Nevertheless*, Dickenscheid et al. teaches a two-dimensional Gaussian distribution and further teaches parameter fitting and a comparing module (see *fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30). Kim et al., Dickenscheid et al., and Adler et al.* are analogous art because they are from the same field of endeavor and that that the method and apparatus teaches by Adler et al. is similar to that of the CMP process simulation method of Dickenscheid et al. and Kim et al. Therefore, It would have been obvious to one ordinary skilled in the art at the time of the applicant's invention to combine the Fourier calculations of Adler et al. with the CMP process simulation of Kim et al and Dickenscheid et al. because Adler et al. teaches the advantage of using a composite different signal to improve tradeoff of sensitivity vs. false defects and nuisance defects and the ability to classify defects

according to the area where they appear (*see para 0084-0092*) and Dickenscheid et al. teaches the advantage of planarized surface to carry out with high-resolution subsequent exposure (*col.1 lines 14-63*).

6.2 Regarding claim 3, the combined teachings of Kim et al., Dickenscheid et al., and Adler et al. substantially teach the mesh adjusting part for sampling meshes of said first and second measured data so as to match the mesh of said pattern density two-dimensional distribution image *(see Dickenscheid et al. fig.1-4, 8,9, col.5 line 47-col.9 line 30; Kim et al. fig.3).*

6.3 As per claim 4, the combine teachings of Kim et al., Dickenscheid et al. and Adler et al. substantially teach the step of receiving: a third measured data about a height distribution of irregularities of an under laid layer of said fabrication pattern which is measured before forming said fabrication pattern, and a first and second measured data adding parts that add said third measured data to said first and second calculated data, respectively (see *Dickenscheid et al. fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30); also Adler et al. fig.3,9-10, and Kim et al. figs.3,7-9).*

6.4 With regards to claim 5, the combine teachings of Kim et al., Dickenscheid et al. and Adler et al. substantially teach the mesh adjusting part for sampling meshes of said first, second and third measured data so as to match said mesh of said pattern density two-dimensional distribution image (see *Dickenscheid et al. fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30); also Adler et al. fig. 3,9-10, and also Kim et al. fig.3).*

6.5 With regards to claim 6, the combined teachings of Kim et al., Dickenscheid et al., and Adler et al. substantially teach the pattern density two-dimensional distribution calculating part that receives said pattern density data, expands it in two dimensions based on a coordinate data, and outputs it as a pattern density two-dimensional distribution image (*see Kim et al. fig.3, 5,9, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-5)*; a height distribution calculating part that obtains said first calculated data by executing an operation of multiplying a pattern density at individual parts of said pattern density two-dimensional image by a thickness of a laminated film laminated on said pattern density two-dimensional distribution image (*see Kim et al. fig.3,5,9, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-5)*; and a CMP image calculating part that obtains said second calculated data by (i) calculating, based on said first calculated data, a two-dimensional distribution image of a polishing pad in a state that said polishing pad used in said chemical mechanical polishing process of said laminated film is pressed against said laminated film, (ii) calculating a two-dimensional distribution image of stress exerted on said polishing pad based on said two-dimensional distribution image of said polishing pad, and (iii) calculating a two-dimensional distribution image of irregularities after polishing said laminated film based on said two-dimensional distribution of said stress *(see Kim et al. fig.3,5,7,9, col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig1-2, and Adler et al. fig.20)*.

6.6 As per claim 7, the combined teachings of Kim et al., Dickenscheid et al., and Adler et al. substantially teach the step of receiving: a third measured data about a height distribution of irregularities of an under laid layer of said fabrication pattern which is measured before forming said fabrication pattern, and a measured data adding part that adds said third measured data to said first calculated data (*see Adler et al. fig.18-20, Kim et al. fig.3, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-4).*

6.7 As per claim 8, the combined teachings of Kim et al., Dickenscheid et al., and Kim et al. substantially teach the mesh adjusting part for sampling meshes of said first and second measured data so as to match the mesh of said pattern density two-dimensional distribution image (*see Adler et al. fig.9-11, 18-20, Kim et al. fig.3, also col.1 line 9-col.4 line 29 and col.7 line 24-col.12 line 18; also Dickenscheid et al. fig.1-4).*

6.8 With regards to claim 9, the combined teachings of Kim et al., Dickenscheid et al., and Adler et al. substantially teach the mesh adjusting part for sampling meshes of said first, second and third measured data so as to match said mesh of said pattern density two-dimensional distribution image (see *Dickenscheid et al. fig.1-4, col.1 line 15-col.4 line 62; also col.5 line 47-col.9 line 30); also Adler et al. fig. 3,9-10, and also Kim et al. fig.3).*

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7.1 Ohtake et al. (USPG_PUB No. 2003/0277576) teaches a method and device for inspecting surface of semiconductor device.

7.2 Coon et al. (U.S. Patent No. 6,988,060) teaches an alignment simulation method.

7.3 Ushio et al. (USPG_PUB 2004/0248411) teaches a method and device for simulation method and manufacturing semiconductor device.

7.4 Mikolas (USPG_PUB 2004/0005769) teaches a method and apparatus for endpoint detection.

8. Claims 1, 3-9 are rejected and this action is non-final. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre Pierre-Louis whose telephone number is 571-272-8636. The examiner can normally be reached on Mon-Fri, 8:00AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 12, 2006

APL

PAUL RODRIGUEZ
SUPERVISORY PATENT EXAMINER
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9/14/06